

## **REMARKS**

The office action of 05/14/2004 has been reviewed and its contents carefully noted. Reconsideration of this case, as amended, is requested. Claims 1-6, 8-14 remain in this case, claims 15 through 33 being added, and claim 7 being cancelled by this response. Claims 1, 6, 12, and 14 being amended to clarify the subject matter in said claims. The amendments made to claim 1 are fully supported by Figure 2c. No new matter has been added.

Applicant called Examiner on May 20, 2004 regarding clarification of the patent number for the Kosco reference listed in paragraph 3. Examiner returned Applicant's call on May 27, 2004 and stated that the US Patent No. for Kosco is 6,338,747. Applicant thanks Examiner for clarification.

### **Preliminary Comments**

Claims 15, 26, and 29 restate claims 1, 12, and 14 as filed except that the composition of the metallurgic powder has been moved to a dependent claim to clarify the point that the method is novel.

The numbered paragraphs below correspond to the numbered paragraphs in the Office Action.

2. Examiner stated Applicant's obligation under 37 CFR 1.56 to state whether the subject matter of the various claims was commonly owned at the time any inventions covered therein were made.

The subject matter of the various claims were commonly owned at the time the inventions covered therein were made.

### **Rejection(s) under 35 U.S.C. §103**

3. Claims 1-14 were rejected under 35 U.S.C. 103(a) as being unpatentable over Kosco (US 6,338,747) in view of Komai et al. (US 6,379,611).

Applicant respectfully disagrees.

Kosco teaches a method of forming a part using a metal powder composition, which is compressed and then undergoes a series of heating and cooling treatments.

Komai et al. teaches a composition of high strength, low alloy, heat resistant steel. The steel is made by conventional steel manufacturing process, and therefore must start with iron or scrap metal, which is then melted down in a furnace resulting in molten metal. Once the iron or scrap metal is melted, certain elements are added to the molten metal to aid in the process of adding carbon to the iron to form steel.

Kosco and Komai et al. cannot be combined. The combination of steps in Kosco and Komai et al. would result in a molten metal that can not be compressed and is not sintered (i.e. putting a hammerhead on a wrench), or powder metals that need to be melted down to form a liquid. The combination cannot and does not teach the steps of the method in Applicant's claim 1 through 31. Reconsideration and withdrawal of the rejection is respectfully requested.

Although the combination of Kosco and Komai et al under 35 USC §103 is overcome, Applicant would like to point out that Applicant's invention is patentable over the method of Kosco.

In Kosco, heating of the green compact occurs at a temperature of 2000-2400°F for 25-30 minutes and holding the compact at the sintering temperature for a sufficient time period to ensure that the individual powders, copper and carbon, diffuse throughout the compact, forming a generally homogenous iron-based alloy (col. 7, lines 41-55).

Applicant's claim 1 includes the step of, "c) heating the compact to 2100°F to 2400°F for 20 to 60 minutes" and then " **d) holding the compact between 1000°F to 1900°F for 5 to 60 minutes, then cooling the compact to room temperature, such that microstructure of the compact becomes mainly Pearlite...**" (emphasis added) as is shown in Figure 2c. In contrast, Kosco teaches heating the green compact at 2000-2400°F and then holding the compact at sintering temperature, which is between 2000-2400°F, not 1000-1900°F, as stated and taught by Applicant's claim 1.

The Examiner pointed to Example 2 of Kosco to add the forming of a densified portion including hot forming at a temperature of 1800°F for 3 minutes in the temperature limitation of

Applicant's step d) but for less time. The sequence of steps in Example 2 of Kosco, is to b) compress powder into a green compact; c) sinter the compact at 2050-2080°F for 30 minutes; d) cool the sintered compact to room temperature; e) dip coat the sintered compact in graphite slurry; f) induction heat the compact for 3 minutes; g) transfer compact to a die held at 600°F; and h) slowly cooling the compact in the die to room temperature.

The steps in Example 2 are not similar to Applicant's steps, nor teach or suggest Applicant's steps, specifically

"b) compressing the metallurgic powder at a pressure of 25 to 65 tsi to provide a green compact;

"c) heating the compact to 2100°F to 2400°F for 20 to 60 minutes;

"d) holding the compact between 1000°F to 1900°F for 5 to 60 minutes, then cooling the compact to room temperature, such that microstructure of the compact becomes mainly Pearlite;

"e) increasing the density of at least a portion of the compact to greater than 7.6g/cc;

"f) heating the compact to 1650°F to 2100°F for 20 to 80 minutes;

"g) cooling the compact at rate of 150°F to 250°F per minute; and

"h) heating the compact to 300°F to 1000°F for 30 to 90 minutes, such that the microstructure of the compact becomes tempered martensite, 0 to 20% bainite, and less than 5% retained austenite and has a hardness of 27 to 50 HRC."

Applicant heats the compact (step c) and then holds the compact at 1000-1900°F and then cools the compact to room temperature, such that the microstructure becomes Pearlite (step d) and then increases the density of at least portion of the compact (step e) in claim 1. Additional heating of the compact, as taught by Kosco to achieve the holding of temperature step is not required or present in Applicant's claim 1.

Furthermore, Kosco's method discloses two cooling steps, one of which takes place right after sintering at a cooling rate that does not exceed 60°F/minute and brings the compact down to room temperature and the another cooling step that takes place after a second sintering and is an accelerated cooling rate of 120-400°F/minute. Applicant's claim 1 does not teach or suggest additional cooling steps. Applicant's claim 1 discloses two cooling steps cooling the compact **after** the compact has been held between 1000-1900°F in step d and in step g, only after the compact has been compressed in step b, sintered in step c, held between 1000-1900°F and cooled to room temperature in step d, increased the density of a portion of the compact in step e, and is heated again to 1650-2100°F in step f.

Applicant's claim 12, states,

"c) heating the compact to 2100°F to 2400°F for 20 to 60 minutes and cooling the compact to room temperature;

"d) heating the compact to 1650°F to 2100°F for 20 to 80 minutes;

"e) cooling the compact at a rate of 150°F to 250°F per minute..."

The compact in Kosco is heated at 2050-2080°F for 30 minutes, which does not teach or suggest heating the compact at 1650°F to 2100°F for 20 to 80 minutes as stated in Applicant's claim 12. Furthermore, the compact is cooled at a quick rate of 150-250°F, which is not taught or suggested by Kosco. Therefore, Applicant's steps and sequence of steps is not taught or suggested by Kosco.

Applicant's claim 14 states,

"c) heating the compact to 1650°F to 2100°F for 20 to 80 minutes;

"d) cooling the compact at a rate of 150°F to 250°F per minute;"

The compact in Kosco is heated at 2050-2080°F for 30 minutes, which does not teach or suggest heating the compact at 1650°F to 2100°F for 20 to 80 minutes as stated in Applicant's claim 14. Furthermore, the compact is cooled at a quick rate of 150-250°F, which is not taught

suggested by Kosco. Therefore, Applicant's steps and sequence of steps is not taught or suggested by Kosco.

As previously stated, and repeated here by reference, Kosco and Komai et al. cannot be combined. The combination of steps in Kosco and Komai et al. would result in a molten metal that can not be compressed and is not sintered (i.e. putting a hammerhead on a wrench), or powder metals that need to be melted down to form a liquid. The combination cannot and does not teach the steps of the method in Applicant's claim 1 through 31. Reconsideration and withdrawal of the rejection is respectfully requested.


Therefore, it is respectfully suggested that the rejection of independent claims 1, 12, and 14 as being anticipated by Kosco (6,338,747) in view of Komai et al. (6,379,611) is overcome. Dependent claims 2-11 and 13, being dependent upon and further limiting independent claims 1, 12, and 14, should also be allowable for that reason, as well as for the additional recitations they contain. New claims 15 through 31 should also be allowable for the reasons stated above. Reconsideration and withdrawal of the rejection are respectfully requested.

### **Conclusion**

Applicant believes the claims, as amended, are patentable over the prior art, and that this case is now in condition for allowance of all claims therein. Such action is thus respectfully requested. If the Examiner disagrees, or believes for any other reason that direct contact with Applicants' attorney would advance the prosecution of the case to finality, he is invited to telephone the undersigned at the number given below.

"Recognizing that Internet communications are not secured, I hereby authorize the PTO to communicate with me concerning any subject matter of this application by electronic mail. I understand that a copy of these communications will be made of record in the application file."

Respectfully Submitted:  
Sun et al.-

By:   
Lynda Wood, Reg. No. 53,791

Attorney for Applicant

BROWN & MICHAELS, P.C.  
400 M&T Bank Building - 118 N. Tioga St.  
Ithaca, NY 14850  
(607) 256-2000 • (607) 256-3628 (fax)  
e-mail: lwood@bpmlegal.com  
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